60 × 60 × 56 mm *San Ace 60* 9CRH Type Counter Rotating Fan

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1. Introduction

With the development and growing demand of AI technology and ICT equipment, data centers and GPU servers are becoming increasingly crucial in supporting society and the economy. As equipment performance rapidly improves, so does the density and heat generation. Considering such market trends, many customers are adopting counter rotating fans, with a growing demand for fans that offer even higher cooling performance.

We previously developed and launched the 60 × 60 × 56 mm *San Ace 60* 9CRA type Counter Rotating Fan (hereinafter, "current product"). Now, in response to this market demand, we developed and launched the 60 × 60 × 56 mm *San Ace 60* 9CRH type Counter Rotating Fan (hereinafter, "new product").

The new product features significantly reduced power consumption, qualifying for the Eco Products Plus certification, our new eco-design standard.

This article introduces the features and performance of the new product.

2. Product Features

Figure 1 shows the new product.

The new product delivers a higher airflow, higher static pressure, and lower power consumption while maintaining the same size as the current product.

Fig. 1 60 × 60 × 56 mm *San Ace 60* 9CRH type

3. Product Overview

3.1 Dimensions

Figure 2 shows the dimensions of the new product. It is designed to be compatible with the current product in dimensions and mounting.

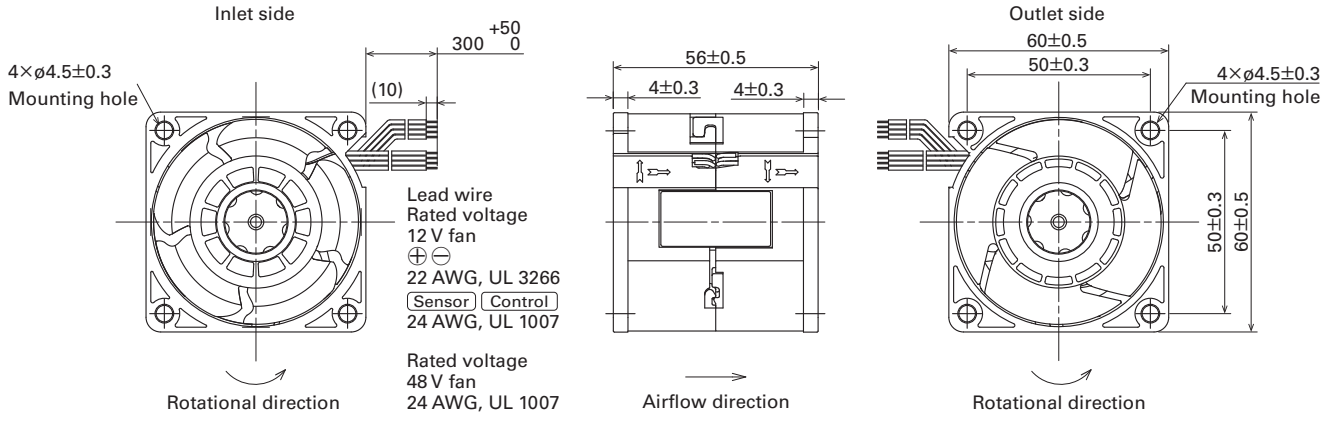

Fig. 2 Dimensions of 60 × 60 × 56 mm *San Ace 60* 9CRH type (Unit: mm)

Table 1 General specifications of 60 × 60 × 56 mm *San Ace 60* 9CRH type

Model no.	Rated voltage [V]	Operating voltage range [V]	PWM duty cycle* [%]	Rated current [A]	Rated input [W]	Rated speed [min^{-1}]		Max. airflow		Max. static pressure		Sound pressure level [dB(A)]	Operating temperature range [°C]	Expected life [h]
						Inlet side	Outlet side	[m^3/min]	[CFM]	[Pa]	[inchH$_2$O]			
9CRH0612P6G001	12	10.8 to 13.2	100	5.6	67.2	26100	26800	2.57	90.8	3350	13.4	78	-20 to +70	40000 at 60°C (70000 at 40°C)
			20	0.16	1.9	3900	4000	0.35	12.3	74	0.3	34		
9CRH0648P6G001	48	36 to 60	100	1.4	67.2	26100	26800	2.57	90.8	3350	13.4	78		
			20	0.11	5.3	3900	4000	0.35	12.3	74	0.3	34		

Note : PWM input frequency is 25 kHz. Speed is 0 min^{-1} at 0% PWM duty cycle for models without ratings listed at 0%. The speed when control terminal is open is the same as when the PWM duty cycle is 100%.

3.2 Specifications

3.2.1 General specifications

Table 1 shows the general specifications of the new product.

3.2.2 Airflow vs. static pressure characteristics

Figure 3 shows the airflow vs. static pressure characteristics of the new product.

3.2.3 PWM control

The new product comes with PWM control for controlling fan speed.

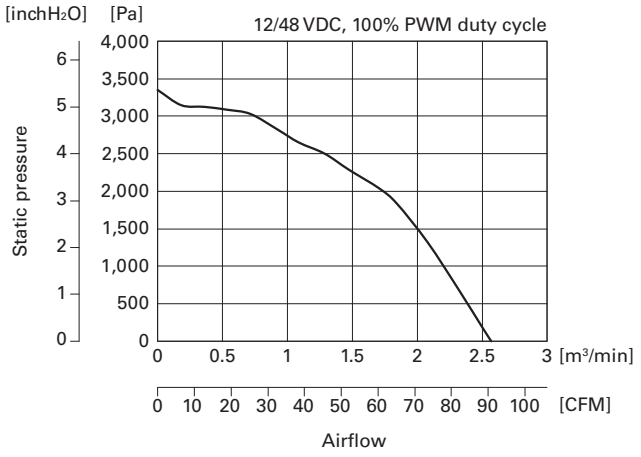

Fig. 3 Airflow vs. static pressure characteristics of the new product

4. Key Points of Development

The new product employs a highly efficient 3-phase drive motor, as well as newly designed impeller and frame shapes with high aerodynamic performance, achieving higher airflow, higher static pressure, and lower power consumption compared to the current product.

The key points of development are as follows.

4.1 Motor design

Achieving higher airflow and static pressure than the current product required a faster speed. To reduce power consumption, improving motor efficiency is essential. To achieve these, the new product uses a 3-phase drive motor, which is suitable for achieving both high speed and high efficiency, while a bipolar drive (single-phase full-wave) motor is used in the current product. These design improvements has resulted in higher airflow, increased static pressure, and lower power consumption.

4.2 Impeller and frame design

Figure 4 compares the fan blade shapes of the new and current products. Compared to the current product, the shape of the inlet fan blades has been redesigned significantly to adopt the shape of our 60 × 60 × 38 mm 9HVA type fan, which has a proven track record of high static pressure and low power consumption. The outlet fan blades have been revised to have a larger blade area than that of the current product. Also, we optimized the combination of inlet and outlet fans, ensuring high performance.

Besides the blade shape, the frame shape and fan speed are also key performance-determining factors of cooling fans. As this product is a Counter Rotating Fan, which involves two axial fans, finding the optimal combination was more challenging than normal with the number of parameters to consider being doubled. To identify the optimal combination in the shortest possible time, we conducted simulations alongside evaluation on actual equipment, successfully achieving high airflow, high static pressure, low power consumption, and low noise.

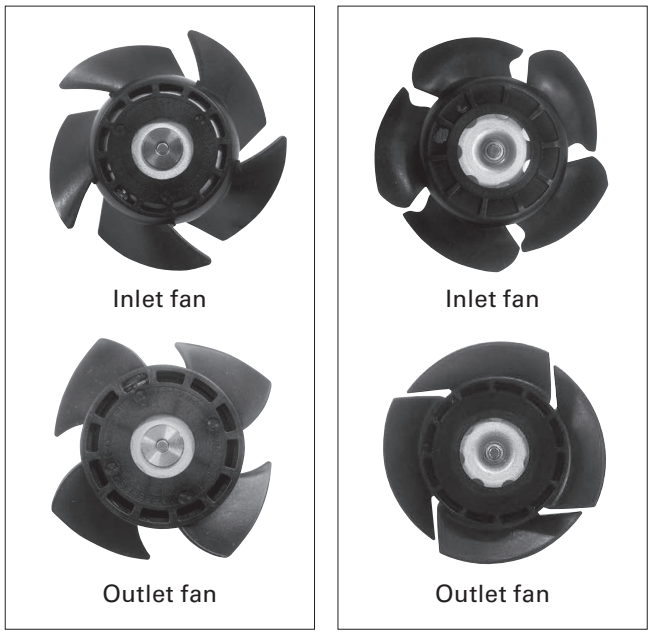

Fig. 4 Comparison of the impeller shape of the new and current products

Figure 5 compares the frame shapes at the frame joints of the new and current products.

A Counter Rotating Fan consists of two axial fans connected in series, and the current product has protruding flanges at the joint of the inlet and outlet fans. However, considering that today's equipment is becoming denser, it jhas been required to leave as much space as possible around the fan frame for part mounting and wiring purposes. To address this, we redesigned the frame fixing structure in the new product, and we eliminated the flanges and instead adopted embedded joint fixtures on the frame surface.

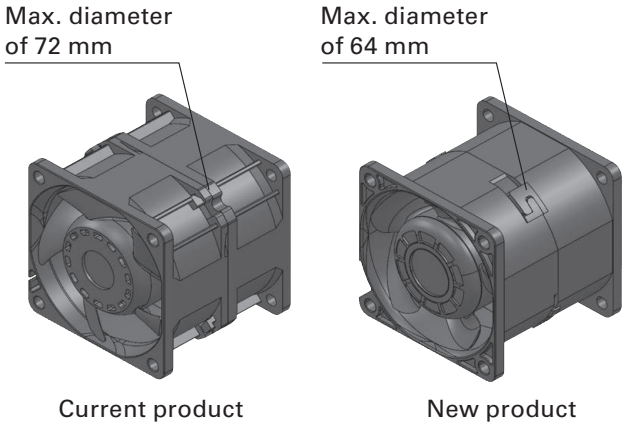

Fig. 5 Frame shape comparison at joint parts of the new and current products

By refining the shape of the joint fixtures, we ensured workability and strength while minimizing the protrusion on the frame. This maximized the space around the frame, resulting in a compact design that saves space when the fan is installed inside equipment.

5. Comparison of New and Current Products

5.1 Comparison of airflow vs. static pressure characteristics

Figure 6 compares the airflow vs. static pressure characteristics of the new and current products.

Compared to the current product, the maximum airflow and maximum static pressure of the new product have improved by 12% and 196%, respectively. This has resulted in high airflow and high static pressure.

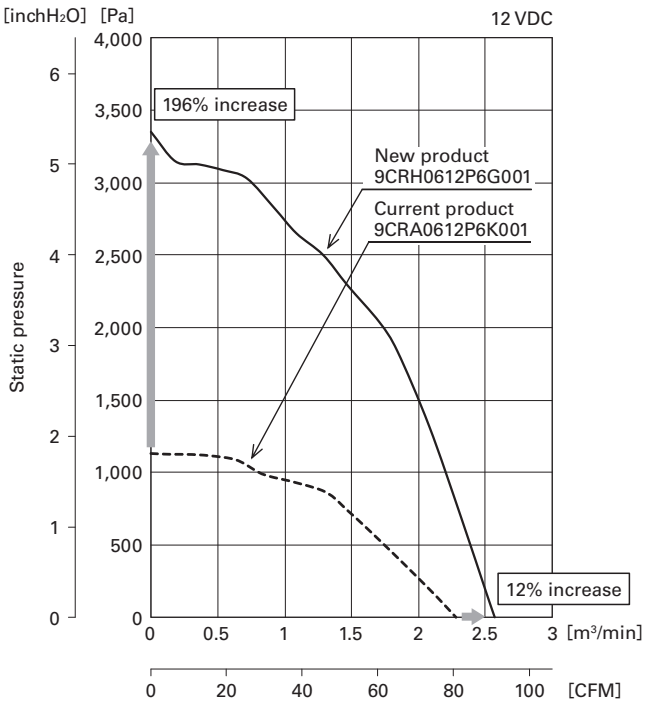

Fig. 6 Airflow vs. static pressure characteristics of the new and current products

5.2 Power consumption and noise comparison

Figure 7 compares the power consumption and noise level of the new and current products when operating with the same operating airflow.

At the estimated system impedance (equipment ventilation resistance) shown in the figure, the new product consumes 22% less power and produces 4 dB(A) less noise than the current product. This has resulted in a higher efficiency and lower noise.

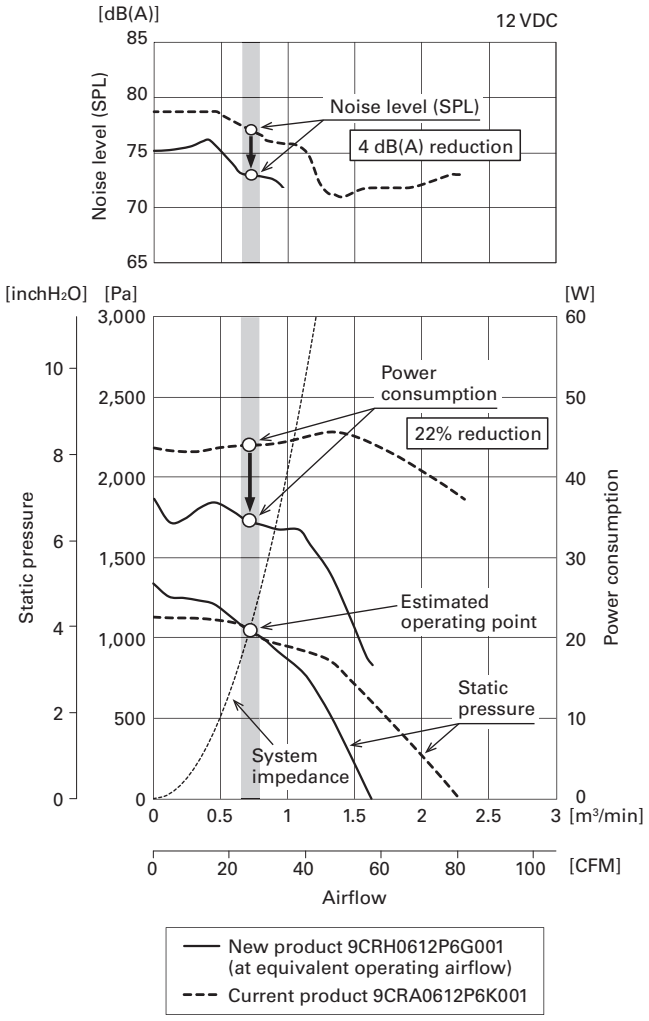

Fig. 7 Power consumption / Noise comparison between the new and current products

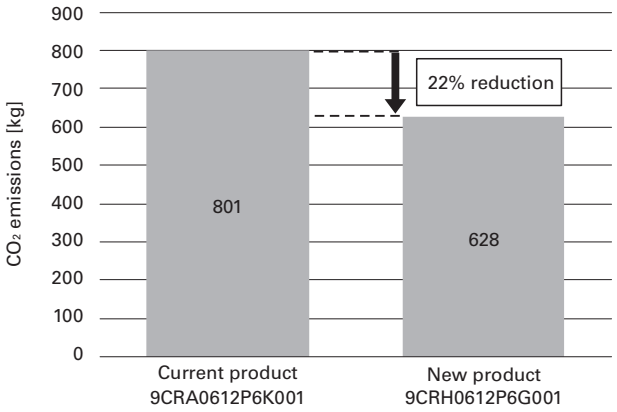

Fig. 8 CO_2 emissions comparison using our LCA calculation software (40,000 hours, when operating with the same operating airflow)

Fig. 9 Symbol and logo of Eco Products Plus

5.3 Comparison of inlet-outlet joint parts

As shown in Figure 5, the maximum diameter of the inlet-outlet joint has been reduced by 11% compared to the current product, from ø72 mm to ø64 mm.

5.4 Environmental impact comparison

Figure 8 compares the CO_2 emissions of the new and current products over their life cycles.

Thanks to its greatly reduced power consumption, the new product emits 22% less CO_2 over its product life cycle compared to the current product. This reduction was rated highly, leading to the new product being qualified as an Eco Product Plus. Figure 9 shows the Eco Product Plus symbol and logo.

6. Conclusion

This article has introduced the features and performance of the newly developed 60 × 60 × 56 mm *San Ace 60* 9CRH type Counter Rotating Fan.

The new product delivers higher airflow and static pressure than the current product. Moreover, it achieves lower power consumption and lower noise at the same airflow. These parameters earned high scores in our assessment, earning the Eco Products Plus certification of the product. Moreover, the eliminated flanges at frame joints and reduced maximum diameter led to downsizing, giving it a higher degree of design freedom for customers when mounted in their equipment.

We will continue to help our customers create new value by swiftly meeting market demand and offering eco-friendly products.

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